CLAIMS

1. A microarray reaction device, which device comprises:

a) a microarray chip comprising a plurality of microarray areas; and

b) a cover comprising a plurality of projections and a supporting structure;

wherein a plurality of reaction spaces are formed between said microarray areas of said microarray chip and said projections of said cover, and the volumes of said reaction spaces are substantially identical and controllable by the height of said supporting structure and the areas of said projections.

2. The microarray reaction device of claim 1, wherein the microarray chip is a slide.

3. The microarray reaction device of claim 1, wherein the microarray chip further comprises an enclosure to form a plurality of separated microarray areas on the microarray chip and to form a plurality of separated reaction spaces.

4. The microarray reaction device of claim 3, wherein the thickness of the enclosure ranges from about 0.05mm to about 50mm.

5. The microarray reaction device of claim 3, wherein the enclosure has a shape selected from the group consisting of a square, a rectangle, a circle, an ellipse, an oval and an irregular shape.

6. The microarray reaction device of claim 1, wherein the cover further comprises a through-hole to deliver fluid into the plurality of reaction spaces.

7. The microarray reaction device of claim 6, wherein the number of the through-holes ranges from about 1 to about 2,500.

8. The microarray reaction device of claim 6, which has dentical or different number of the through-holes and the projections.

9. The microarray reaction device of claim 6, wherein the transverse cross-section of the through-holes has a shape selected from the group consisting of a square, a rectangle, a circle, an ellipse, an oval and an irregular shape.

10. The microarray reaction device of claim 6, wherein the through-holes have a diameter ranging from about 0.01 mm to about 100 mm.

11. The microarray reaction device of claim 1, wherein the number of the projections and/or the microarray areas ranges from about 2 to about 2,500.

12. The microarray reaction device of claim 1, which has dentical or different number of the projections and the microarray areas.

13. The microarray reaction device of claim 1, wherein the projections and the microarray areas have identical or different shape(s) and/or surface area(s).

14. The microarray reaction device of claim 1, wherein the height of the projections ranges from 0.01mm to 50mm.

15. The microarray reaction device of claim 1, wherein the surface of the projections has a shape selected from the group consisting of a square, a rectangle, a circle, an ellipse, an oval and an irregular shape.

16. The microarray reaction device of claim 1, wherein the surface of the projections has an area ranging from about 0.01 mm^2 to about 600 mm^2.

17. The microarray reaction device of claim 1, wherein the plurality of reaction spaces have a height ranging from about 0.001 mm to about 1 mm.

18. The microarray reaction device of claim 1, wherein the plurality of reaction spaces have a volume ranging from about 0.01 mm^3 to about 600 mm^3.

19. The microarray reaction device of claim 3, wherein the microarray chip, the enclosure, and/or the cover comprises a material selected from the group consisting of a silicon, a plastic, a glass, a ceramic, a rubber, a metal, a polymer, a paper and a combination thereof.

20. The microarray reaction device of claim 1, wherein the cover comprises a plastic.

21. The microarray reaction device of claim 20, wherein the cover is injection molded.

22. The microarray reaction device of claim 20, wherein the plastic is selected from the group consisting of polycarbonate, methylmethacrylate, polystyrene, acrylonitrile-butadiene-styrene (ABS), polyethylene and polypropylene.

23. The microarray reaction device of claim 1, wherein the cover comprises a glass.

24. The microarray reaction device of claim 23, wherein the cover is fabricated by a method selected from the group consisting of gluing, dicing/cutting, slicing, anodic bonding, ultrasonic welding, and a combination thereof.

25. The microarray reaction device of claim 3, wherein the enclosure comrises a rubber attached to a double-coated tape.

26. The microarray reaction device of claim 25, wherein the enclosure is fabricated by stamping.

27. The microarray reaction device of claim 25, wherein the rubber is selected from the group consisting of silicone, caoutchouc, butyl, urethane and neoprene.

28. The microarray reaction device of claim 3, wherein the enclosure comrises a single coated tape.

29. The microarray reaction device of claim 28, wherein the enclosure is fabricated by stamping.

30. The microarray reaction device of claim 1, wherein a reactant capable of binding to an analyte is immobilized in a microarray area.

31. An article of manufacture, which article of manufacture comprises:

a) packaging material;

b) a microarray reaction device of claim 1; and

c) a label indicating that the article is for assaying an analyte.

32. A method for assaying an analyte, which method comprises:

a) providing a microarray reaction device of claim 1;

b) attaching a plurality of reactants to said plurality of microarray areas and/or said plurality of projections of said microarray reaction device provided in a), wherein at least one of said reactants is capable of binding to an analyte to be analyzed;

c) contacting a sample suspected of containing said analyte with said reactant(s) provided in step a) under suitable conditions to allow binding of said analyte, if present in said sample, to said reactant(s); and

d) assessing binding between said analyte to said reactant(s) to determine presence and/or amount of said analyte in said sample.

33. The method of claim 32, wherein the analyte is selected from the group consisting of a cell, a cellular organelle, a virus, a molecule and an aggregate or complex thereof.

34. The method of claim 33, wherein the cell is selected from the group consisting of an animal cell, a plant cell, a fungus cell, a bacterium cell, a recombinant cell and a cultured cell.

35. The method of claim 33, wherein the cellular organelle is selected from the group consisting of a nuclei, a mitochondrion, a chloroplast, a ribosome, an ER, a Golgi apparatus, a lysosome, a proteasome, a secretory vesicle, a vacuole and a microsome.

36. The method of claim 33, wherein the molecule is selected from the group consisting of an inorganic molecule, an organic molecule and a complex thereof.

37. The method of claim 36, wherein the organic molecule is selected from the group consisting of an amino acid, a peptide, a protein, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a vitamin, a monosaccharide, an oligosaccharide, a carbohydrate, a lipid and a complex thereof.

38. The method of claim 32, wherein the sample is a mammalian sample.

39. The method of claim 38, wherein the mammal is selected from the group consisting of bovine, goat, sheep, equine, rabbit, guinea pig, murine, human, feline, monkey, dog and porcine.

40. The method of claim 32, wherein the sample is a clinical sample.

41. The method of claim 40, wherein the clinical sample is selected from the group consisting of serum, plasma, whole blood, sputum, cerebral spinal fluid, amniotic fluid, urine, gastrointestinal contents, hair, saliva, sweat, gum scrapings and tissue from biopsies.

42. The method of claim 41, wherein the clinical sample is a human clinical sample.

43. The method of claim 32, wherein the reactant(s) binds specifically with the analyte.

44. The method of claim 32, wherein the reactant is selected from the group consisting of a cell, a cellular organelle, a virus, a molecule and an aggregate or complex thereof.

45. The method of claim 32, wherein the reactant is an antibody.

46. The method of claim 32, wherein the reactant is a nucleic acid.

47. The method of claim 32, which is used in a direct assay format, a sandwich assay format or a competition assay format.

48. The method of claim 32, wherein a different plurality of reactants are used to assay a single analyte.

49. The method of claim 32, wherein a different plurality of reactants are used to assay a different plurality of analytes.

50. The method of claim 32, wherein a plurality of reactants are attached to the plurality of microarray areas or the plurality of the projections of the microarray reaction device.

51. The method of claim 32, wherein all reactants are capable of binding to an analyte to be analyzed.

52. A kit for assaying an analyte, which kit comprises:

a) a microarray reaction device of claim 1;

b) means for attaching a plurality of reactants to said plurality of microarray areas and/or said plurality of projections of said microarray reaction device provided in a), wherein at least one of said reactants is capable of binding to an analyte to be analyzed; and

c) means for assessing binding between said analyte to said reactant(s) to determine presence and/or amount of said analyte in said sample.

53. The kit of claim 52, which further comprises a plurality of reactants, wherein at least one of the reactants is capable of binding to an analyte to be analyzed.

54. The kit of claim 52, which further comprises an instruction for using the kit to assay the analyte.

55. A microarray reaction device, which device comprises:

a) a microarray chip comprising a microarray area;

b) a cover comprising a projection and a supporting structure; and

wherein a reaction space is formed between said microarray area of said microarray chip and said projection of said cover, and the volumes of said reaction space is controllable by the height of said supporting structure and the area of said projection.

56. An article of manufacture, which article of manufacture comprises:

a) packaging material;

b) a microarray reaction device of claim 55; and

c) a label indicating that the article is for assaying an analyte.

57. A method for assaying an analyte, which method comprises:

a) providing a microarray reaction device of claim 55;

b) attaching a reactant to said microarray area and/or said projection of said microarray reaction device provided in a), wherein said reactant is capable of binding to an analyte to be analyzed;

c) contacting a sample suspected of containing said analyte with said reactant provided in step a) under suitable conditions to allow binding of said analyte, if present in said sample, to said reactant; and

d) assessing binding between said analyte to said reactant to determine presence and/or amount of said analyte in said sample.

58. A kit for assaying an analyte, which kit comprises:

a) a microarray reaction device of claim 55;

b) means for attaching a reactant to said microarray area and/or said projection of said microarray reaction device provided in a), wherein said reactant is capable of binding to an analyte to be analyzed; and

c) means for assessing binding between said analyte to said reactant to determine presence and/or amount of said analyte in said sample.